REMARKS

In the Office Action, claims 2 and 4-6 were rejected. By this Response, new claims 48 and 49 are added. Upon entry of the amendments, claims 2, 4-6, 48 and 49 will be pending in the present patent application. The drawings were objected to. Reconsideration and allowance of all pending claims are requested.

Objection to the Drawings

The drawings were objected to because the label "Figure" on the first sheet should have read "Figure 1". The figure has been amended as required by the Examiner. Withdrawal of the objection and approval of the amendment are requested.

Rejections Under 35 U.S.C. § 103

Claims 2 and 4-6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsai et al., U.S. patent application No. 200220121856 (hereinafter "Tsai") in view of Lee et al., U.S. Patent No. 6,346,775 (hereafter "Lee"). For a *prima facia* case of obviousness, the Examiner must set forth the differences in the claim over the applied reference, set forth the proposed modifications of the reference, which would be necessary to arrive at the claimed subject matter, and explain why the proposed modification would be obvious. Applicants respectfully traverse these rejections. Claim 2 and the claims depending there from are believed to be patentable for the reasons summarized below.

Claim 2 recites a composition for electron emitters of gas discharge devices including a "mixture" of carbon nanotubes and oxygen-containing compounds of alkaline-earth metals. The oxygen-containing alkaline-earth metals are alkaline-earth metal oxides. The carbon nanotubes have a diameter in a range from about 1 nm to about 200 nm. Applicants clearly refer to the "mixture" of carbon nanotubes and oxygen-containing compounds of alkaline-earth metals that may be used for coating a filament. For example, in the example section of the application, particularly in paragraph 10, on

page 7, a method of making such a "mixture" with a temporary binder and then depositing the "mixture" on to a cathode is described. On pages 8 and 9 more details on the method of making and utilizing the "mixture" including nanotubes and oxygen-containing compounds of alkaline-earth metals are given. Starting with a "mixture" greatly simplifies fabrication of devices based upon the claimed compositon, and makes such processing economical, as well as affords very precise control over the relative composition of the carbon-nanotubes and alkaline-rare earth metal oxides. Moreover, the final composition of the electron emitter may be adjusted by altering the composition of the "mixture".

The Examiner asserted that claims 2 and 4 are not patentable as Tsai discloses a composition for electron emitters of a gas discharge device comprising carbon nanotubes, the composition being coated on said electron emitters. However, Tsai does not disclose the diameter of the carbon nanotubes. It is well known that the properties of carbon nanotubes are extremely sensitive to their diameters and this does not motivate one to choose carbon nanotubes having a diameter in a range from about 1 nm to about 200 nm as recited in claim 1.

Moreover, as the Examiner acknowledged, Tsai does not disclose a composition comprising alkaline-earth metal oxides. In fact, Tsai teaches away from using alkaline-earth metal oxides such as BaO for fluorescent lamp applications as they suffer from continuous depletion. *See*, e.g., Tsai, paragraph 6.

The Examiner relied upon Lee for teaching that the addition of CaO to carbon nanotubes lowers a driving voltage and ultimately improves luminance in a gas discharge device. Lee discloses a completely different structure. Lee discloses "a secondary electron amplification structure" including *a layer of MgO stacked on the carbon nanotubes layer* (shown in figure 3) for utilization in flat panel display devices such as liquid crystal displays, plasma display panels, or field emission displays.

The paragraph cited by the Examiner at col. 2, 21-35, reads:

> It is another object of the present invention to provide a plasma display panel and a liquid display panel back light, which employ the secondary electron amplification structure capable of lowering a driving voltage and improving luminance by maximizing secondary electron emission.

Lee here refers to the luminance of the liquid display panel back light, which is not a gas discharge device at all. Further discussion on this is given on paragraph 7, lines 20-30 of Lee.

Lee teaches that this kind of multilayered structure of MgO disposed on to a carbon nanotubes layer exhibits enhanced secondary electron emission coefficient caused by electrons or by ions. However, like Tsai, Lee does not teach the use of a "mixture" of carbon nanotubes and alkaline-earth metal oxides for gas discharge device applications such as fluorescent lamps. In fact, Lee does not suggest combining carbon nanotubes with alkaline-earth metal oxides.

It is to be noted that in gas discharge devices such as fluorescent lamps including carbon nanotubes utilize the field emission properties of carbon nanotubes and not secondary electron emission. The layered structure of Lee including a layer of secondary electron emitters such as MgO/CaO on top of carbon nanotubes has shown improved secondary electron emission, but that does not motivate one of ordinary skill in the art to contemplate on a "mixture" of carbon-nanotubes and alkaline-earth metal oxides for electron emission in gas discharge devices, which utilize mainly thermionic emission from the alkaline-earth metals and field emission (both involving primary electrons) from carbon nanotubes. Further, the conditions in a gas discharge device such as a fluorescent lamp and a flat panel display are very different, including vacuum level and background gas.

Applicants respectfully submit that even in combination the Tsai and Lee references do not establish a *prima facie* case of obviousness. Specifically, even in combination Tsai and Lee do not teach, disclose or suggest a composition for electron emitters of gas discharge devices including a "mixture" of carbon nanotubes and oxygen-containing compounds of alkaline-earth metals, wherein the oxygen-containing alkaline-earth metals are alkaline-earth metal oxides and carbon nanotubes have a diameter in a range from about 1 nm to about 200 nm. Therefore, Applicants submit that independent claim 2 is allowable and respectfully request the Examiner to reconsider rejection of the claim.

With regard to dependent claims 4, 5 and 6, these claims depend directly from allowable claim 2 and are therefore considered to be allowable at least by virtue of their dependency from an allowable base claim.

New Claims 48 and 49

Claim 48 and 49 are believed to be allowable for the same reasons as claims 2, 5 and 6. Claim 48 recites features from claim 2 and certain allowable subject matter from claim 5. And claim 49 recites features from claim 2 and certain allowable subject matter from claim 6. Applicants submit that independent claims 48 and 49 are in condition for allowance.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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